ADVANCE COPY.

Goerz Tenax Cameras "Manufoc" & "Taro" Models

Directions for Use
Price Sixpence
(with Camera Gratis)

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CONTENTS.

Foreword.

The following pages, except perhaps those which deal with the features peculiar to the Tenax Cameras, will scarcely be found necessary by those having even the most elementary knowledge of photographic apparatus, the lengthy instructions being given for the benefit of those entirely unacquainted with photography. It has been thought better that the booklet should err on the side of explaining what may seem to many obvious, rather than that a worker should come across some difficulty for which the booklet offers him no help.

As both the "Manufoc" and "Taro" Tenax Cameras are very similar in construction and the after processes are of course the same with both, the instructions given in this booklet apply equally to both cameras; but where the two models differ from one another separate paragraphs deal with the points in question.

A word as to the arrangement of the book itself. Section I. deals with the actual working of the camera and should be studied by the worker, the camera by his side. The directions should be read, and the camera worked in accordance with them, without any plates being used. If a few minutes be spent in this way before it is attempted to use the camera, greater confidence both in the worker and the instrument will be gained. The greater the worker's knowledge of photography so the less the remaining sections will appeal to him. The beginner, and it is for him that all instruction booklets are really written, is advised, after understanding the first section, to at first only act upon those portions of the remaining sections which are printed in heavy type, for these are the essentials which have to be followed to ensure success. The remaining portions of the booklet can be read later.

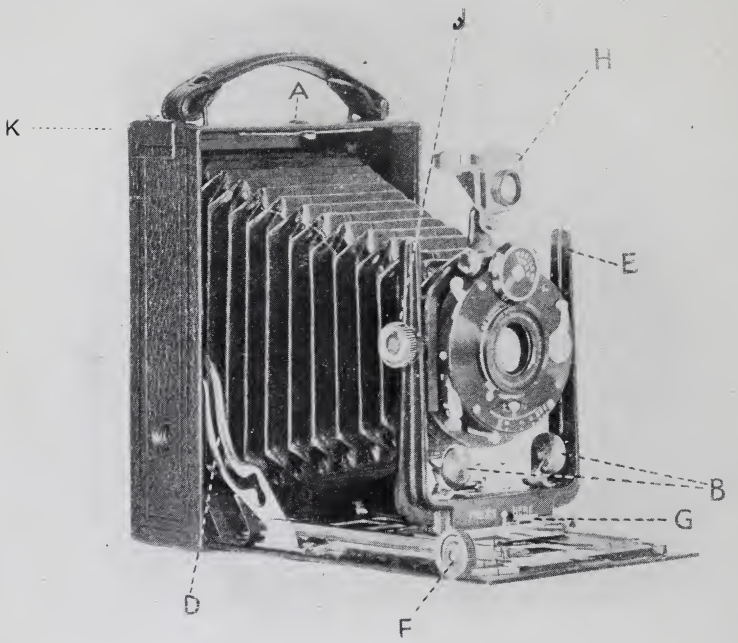

Fig. 1.—The Goerz "Manufoc Tenax."

NOTE.—On five by four, postcard and half-plate cameras the milled head J is not at side but on front of pillar. In the half-plate size the grips B are of a somewhat different form.

SECTION I.

The Manipulation of the Camera and the Shutter.

I. To Open and Close the Camera.

THE "MANUFOC" TENAX. (See Figure 1.)

(*a*) TO OPEN.—Firmly press the concealed button A. The baseboard should be pulled down until the stays

D are locked. With the thumb and forefinger in the grips B at the bottom of the stirrup front, pull out the lens front until it locks at the infinity catch.

(*b*) TO CLOSE.—Disengage the infinity catch by pressing down the lever G and press back the bottom of the stirrup front, where marked "Press here," into the back of the camera. Press in the struts D, and the baseboard can then be lifted up until it catches. To properly close the camera it is essential that the fronts be perfectly central, and that the front carrying the lens is right back in the camera and off the folding baseboard. A line on the pillar E shews when the front is central.

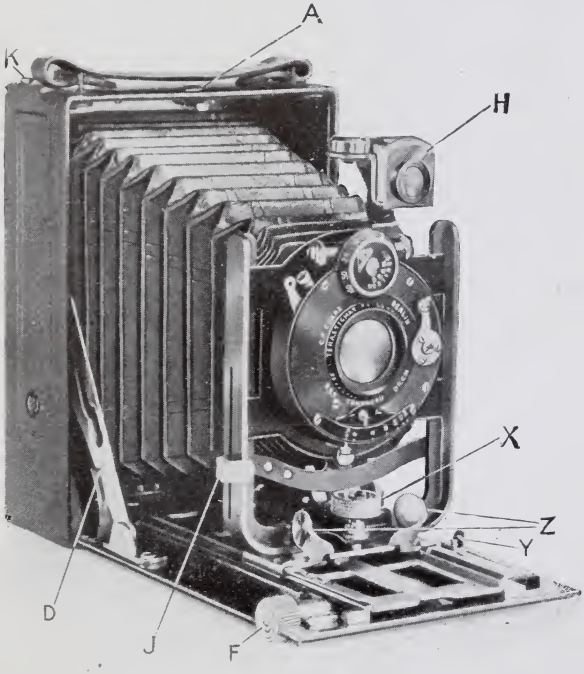

Fig 2.—The Goerz "Taro" Tenax.

THE "TARO" TENAX. (See Figure 2.)

(*a*) TO OPEN.—Firmly press the concealed button A. Pull down the baseboard until the stays D lock.

Grasp with the thumb and forefinger and press inwards the grips Z, and draw out the front until it locks at infinity.

(*b*) TO CLOSE.—Press together the grips Z and at the same time push back the travelling carriage into the back of the camera. Press in the struts D and fold up the baseboard.

II. Operating the Shutter.

(*a*) FOR TIME EXPOSURES OR FOCUSSING.—Set the peg c immediately over the diaphragm scale to Z or T. Press the Antinous release or the discharging lever b, and the shutter will remain open until a second pressure is applied.

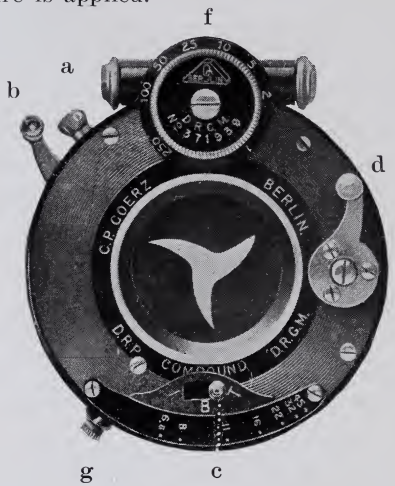

Fig. 3.—The Compound Shutter.

(*b*) FOR BULB EXPOSURES.—Set the peg c to b. The shutter remains open so long as the antinous release or the discharging lever b is pressed.

(*c*) AUTOMATIC & INSTANTANEOUS EXPOSURES.—Rotate dial f until the required speed faces the mark. Set the shutter by firmly pressing down lever d as far as it will go. Shutter is discharged by the trigger b or antinous release.

N.B.—In some shutters there is a difference in the positions of the trigger b and the tube a, into which the antinous release is attached.

b. THE IBSO SHUTTER. (See Figure 4.)

(This shutter is fitted to some of the Taro Cameras.)

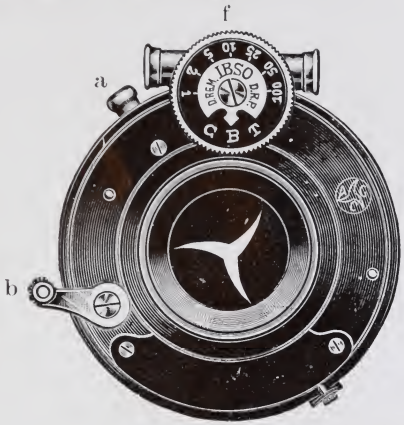

Fig. 4.—The "Ibso" Shutter.

(*a*) FOR TIME EXPOSURES OR FOCUSSING.—Rotate dial f until the letter T faces the pointer. Press the antinous release or the discharging lever b and the shutter will remain open until a second pressure is applied.

(*b*) FOR BULB EXPOSURE.—Rotate dial f until the letter B faces the pointer. The shutter remains open so long as the antinous release or the discharging lever b is pressed.

(*c*) AUTOMATIC & INSTANTANEOUS EXPOSURES.—Rotate dial f until the speed required faces the pointer. No other setting is required. The shutter is discharged by the discharging lever b or the antinous release.

(*d*) LOCKING THE SHUTTER.—If the dial f is rotated until the letter G faces the pointer the shutter is locked so that an exposure cannot be made.

For time or instantaneous exposures the antinous release should be used, irrespective of the particular shutter fitted, as there is less danger of the camera being shaken than if the trigger be used. The end of the antinous release with the bayonet fitting is fixed into tube a of the shutters. For instantaneous exposures, either the trigger or the antinous release can be used, although the former

is preferable, as both hands are then free to support the camera.

III. Making the Exposure.

(*a*) INSTANTANEOUS EXPOSURES. — Direct the camera towards the object to be taken, and see that the principal object is in the centre of the finder H. Withdraw the sheath of the dark slide or film pack adapter, and discharge the shutter.

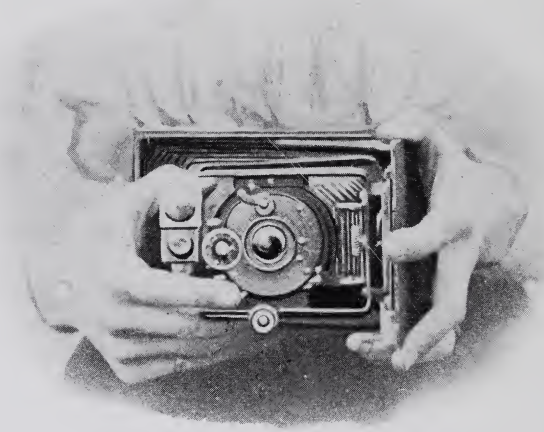

Fig. 5.—Holding the Goerz "Manufoc Tenax" when taking a horizontal picture.

(*b*) TIME EXPOSURES.—If special care be taken the camera can be held in the hand sufficiently steady to give an exposure of 1/10th of a second, but generally speaking for exposures longer than 1/25th of a second, it is necessary to fix the camera on a stand, and a special light and rigid form of aluminium tripod is recommended. It can be fitted with a ball and socket joint which enables the camera to be readily levelled or placed in any position, and horizontal and vertical pictures to be taken without refixing the camera on the tripod. The ball and socket joint also enables the user to point the camera in any direction, and the advantages of a reversing back are obtained

without the bulk which such an addition always entails (fig. 6). The camera can be stood upon a table for time exposures, a coin or piece of card being placed under the baseboard to level the camera.

When using the complete lens always see that the bellows is pulled up to the front of the camera by the tab at each side being fastened to the back of the lens panel.

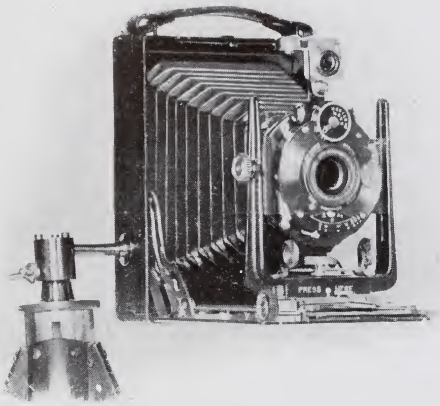

Fig. 6.—Goerz "Manufoc Tenax" with ball and socket joint.

IV. General.

The Rising and Falling Fronts.

If there is too much foreground in the view, or a high building to be brought into the field, raise the front. If on the other hand a view is being taken from a hill-side, and there is too much sky in the view, drop the front. On no account should the camera be tilted to get high buildings on the plate; if this is done the buildings will be no longer perpendicular but will assume the form of a pyramid.

(*a*) "Manufoc" Tenax. For vertical pictures turn the screw J (fig. 1). For horizontal pictures the front is raised or lowered by the screw between the two thumbpieces B.

(*b*) "Taro" Tenax. For vertical pictures the front is raised by lifting up the lever by the milled head J.

For horizontal pictures the front is raised or lowered by sliding the front, first loosening the screw X and then tightening it.

After using the rising and falling front it should be returned to its central position, otherwise difficulty will be experienced in closing the camera.

The Finder.

The Finder (H) shows approximately the amount of subject included by the lens, and when horizontal pictures are being taken must be rotated on its pivot. (See fig. 5). The level attached to the finder is of assistance in ensuring the camera being held level.

The Dark Slides.

(*a*) Single Dark Slides. Remove sheath. Plates are loaded from the front, by being placed against the spring at the bottom of the slide, then pressed down under the clips at the top of the slide.

(*b*) The Double Dark Slides. Take out sheath. The centre pin just under the light trap is pressed aside, the plate inserted, pressed down at the top and the plate pushed back again, when the lever carries over the two catches holding the plates securely.

The dark slides for the postcard cameras are supplied with removable adapters, so that they may be used either with 10 × 15 cm. or $5\frac{1}{2}$ × $3\frac{1}{2}$ plates.

Autochrome Plates. To special order the double dark slides slightly altered are delivered in such a manner that they can be used with these plates. When altered they are not available for use with ordinary plates.

The knob K (figures 1 and 2) has to be pressed aside to slip the dark slides or film pack adapters into the grooves.

The Film Pack Adapter.

Press the catch aside by the knob at the top at the back of the adapter, which can then be opened.

Before the pack is placed in the adapter break the white label on the face of the pack. When the adapter has been closed gently pull out the tab marked "Safety Cover," until the red line appears. Tear off this tab. The first film is now ready for exposure. After exposure pull out tab No. 1 until the red line appears and tear off as before.

No. 2 is now ready for exposure. After each following exposure the same operation must be carried out.

When tab No. 12 is pulled out the last film is returned to the magazine and at the same time the pack is rendered light tight and may be removed from the adapter in daylight and replaced by a fresh one.

If it is wished to develop a number of the films before the whole pack has been exposed, it can be done with the utmost ease by opening the pack in the dark room and removing the required films. The pack is then closed again and the remaining films are ready for use.

As the film pack adapter is fitted with a sheath, which must be removed previous to making the exposure, pictures can, if desired, be focussed on the screen. The film pack adapter for the post card camera is so made that it will take the 10 x 15 cm. film pack, or by means of a removable adapter the $5\frac{1}{4}$ x $3\frac{1}{4}$ film pack.

Caution.—The sheaths of the dark slides, film pack adapter and roll holder are intended to be entirely, not partially, withdrawn. After exposure at once re-insert the sheath of the plate-holder, roll holder or film pack adapter, taking care to hold the sheath as square as possible while entering. If one **corner** only be inserted, light may enter the dark slide through the crevice formed. It is not advisable to have the shutter drawn out any longer than is absolutely necessary, either before or after the exposure.

Hold the Camera Steady.—If the photgrapher shakes during a hand camera exposure, his photograph will show the movement by being fuzzy and worthless. **The camera must be level** (see next paragraph). If a stand is in use, see that it is firm (rigidity it should be noted is not necessarily a synonym for weight, the aluminium stand with stand top affords quite a rigid base for the camera).

Straight Lines.

When photographing buildings the back of the camera must be perpendicular and the camera must be held level, otherwise the lines will converge towards or diverge from the top, according to whether the camera is pointed upwards or downwards. The level attached to the side of the finder enables the user to see when the camera is held level.

Against the Light.

Excellent and most pleasing effects are often obtained when photographing against the light, especially when the sun is partly obscured behind heavy clouds, but it must be understood that always when working against the light there is a danger of reflected images appearing on the plate, whatever lens is used, and such images may probably have to be dodged in printing.

Portraiture.

For portraiture it will be best, generally speaking, to use the full aperture (**i.e.,** largest stop) of the lens.

For full length portraits the sitter should be placed at 12 feet distance from the camera.

For three-quarter length, 6 feet.

For Head and Shoulders, 4 feet.

Interiors.

When photographing interiors focus on the ground glass if possible. First get the best result possible, using the full aperture of the lens, and stop down until everything is sharp, focussing upon a point in the middle distance. F.11 to F.16 will generally be sufficient, and only when absolutely crisp definition is wanted in all the picture planes, from quite near to distant objects, will the small diaphragms be required.

See also the section on the wide angle lens.

SECTION II.

The Lens, Focussing, &c.

DIVISION I.

The Care of the Lens.

The Goerz Lens is not only a photographic tool, but a valuable instrument and should be treated as such, otherwise its performance and value are both likely to deteriorate. **Clean the lens occasionally, and keep in a cool, dry place; avoid damp.**

Cleaning Lenses.

If good clear negatives are to be obtained, keep the lens

Fig. 7.—Showing effect obtained with lens requiring cleaning.

Fig. 8.—Taken with the same lens as above *after* it has been cleaned.

clean. A dirty lens will not give a bright negative; the latter will be veiled as if fogged by light, and there may be a pronounced halo from any prominent high light. If the lens has been exposed to rain or to salt water spray at once carefully wipe off the moisture, and see that the lens surface is dry before the lens is put away or the camera closed; if this is not done the lens surface may become oxodised and "rust" or "tarnish" show. The outer surface of the two cells should be kept free from dust and moisture by being carefully wiped with a soft cloth. With the "Celor," "Syntor," and "Tenastigmat" it is advisable also to occasionally separate the combinations themselves, and to carefully clean their inner surfaces. Replace the cells in their correct positions, i.e., the side with the greatest convexity is the external surface. It will be noticed that the back of each combination has a milled edge, which unscrews, dividing the cell into its two components.

Bubbles in Photographic Lenses.

It is impossible to obtain the glass of which Goerz Lenses are made entirely free from small air bubbles, which have, however, absolutely no effect upon the results obtained with the lens beyond stopping a small proportion of light—in the most unfavourable cases not more than 1/50th per cent. If, therefore, an exposure of 100 seconds be theoretically correct, it would be necessary, if one wished to exactly compensate for the loss of light resulting from the largest bubbles allowed to pass, to give an exposure of 1/50th of a second additional. The defect—if such it can be termed—is consequently in application so insignificant that no complaints can be considered concerning it.

DIVISION II.

The Diaphragm.

The **Iris Diaphragm** has two uses, its first **is to regulate the depth of field** (see p. 16), and the other **to modify the exposure,** as by stopping the lens down, or in other words making the diaphragm smaller, the amount of light which passes through the lens is reduced, and the exposure has, of course, to be increased. Upon the focussing screen the image will in consequence of the decreased light passed

by the lens, be very much darker, but providing the correct exposure has been given the negative will develop up quite bright. The diaphragms of Goerz Lenses are engraved according to the proportion they bear to the focus of the lens in use. This system of "F" values is continually referred to in photographic literature, and is used in most exposure meters and tables. **The diaphragm of the lens is altered by the movement of the pointer g, figs. 3 & 4.**

Apertures of Goerz Lenses.

CELOR.

F.4 8
F.5 5 requires one-third more exposure than that necessary for F.4.8
F.6.3 requires one-third more exposure than that necessary for F.5.5

DAGOR, SYNTOR AND TENASTIGMAT.

F.6.8
F.8 requires two-thirds more exposure than that necessary for F.6 3
and about one-third more than F.6.8
F.11 requires twice the exposure necessary for F.8
F.16 requires twice the exposure necessary for F.11
F.22 requires twice the exposure necessary for F.16
F.32 requires twice the exposure necessary for F.22
F.45 requires twice the exposure necessary for F.32
F.64 requires twice the exposure necessary for F.45

DIVISION III.

Focussing.

However perfect a lens may be it will not give a critically defined picture unless the image is properly focussed. At a certain distance from the camera there is a point when everything is in focus: this point is the distance, or as it is termed in photography "infinity." When the lens is focussed upon an object at infinity, it is at the shortest distance between the lens and plate at which an image is obtainable; for objects nearer than infinity the distance between the plate has to be increased or in other words the lens has to be brought somewhat forward. The camera is so adjusted that when the travelling front is pulled out it automatically locks and the lens is in focus for infinity. The infinity point varies according to the focus of the lens and its aperture, the longer the focus the further away it is, and the greater the aperture also, the further is infinity from the camera. Stopping the lens down will have the effect of bringing this infinity point nearer. For distances

nearer than infinity the lens in theory can only be focussed to obtain one definite distance sharp; in practice this is subject to many modifications.

Every lens has a certain amount of what is called depth of field, or as it is incorrectly and more commonly termed "depth of focus," which, however, is not a quality of the lens itself, but is governed by unchangeable optical laws, and varies according to the focal length of the lens and its aperture. The longer the focal length of the lens and the larger its aperture, the less the depth of the field. In all photographic work advantage is taken of this depth. Consequently when dealing with objects situated nearer than infinity we can by focussing upon an object neither furthest from, nor nearest to, us, but midway distant from us, obtain not only the point focussed upon sharply, but the others approximately so also—much sharper than if we had focussed upon the front or back object. By introducing a smaller stop we can further increase the depth until everything is sharp. We see, therefore, that both the infinity point is brought nearer and the depth of field increased by stopping the lens down; greater depth in short has to be paid for at the cost of rapidity.*

How to Focus.

As with most other things there is a right and a wrong way to focus. For general hand camera work the rule usually observed is to set the camera front to infinity, when everything beyond a certain distance will be in focus. **Up to the 5 x 4 camera it is possible by focussing on infinity and using F11 to obtain almost absolute sharpness in a general view, but if objects are very near to the camera they will not come into focus if the lens is focussed**

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* With such a large aperture as F4.8 (the "Celor" series) the depth of field is very limited, and at this intensity some part or other of a general view must of necessity be blurred, unless it can be taken from a considerable elevation, so as to cut off a great extent of foreground. The legitimate use of such a lens as the "Celor," at full aperture, is therefore for subjects that require little depth, i.e., where all the essential objects in the field of view are approximately the same distance from the camera.

The F4.8 aperture is a valuable adjunct to hold in reserve for suitable subjects and the photographer has only himself to blame for failures if he uses this indiscriminately.

upon infinity, and the lens must consequently be focussed upon a nearer distance. (See preceding note on depth of field).

(*a*) **for infinity; pull out the front of the camera until it locks itself.**

(*b*) **for nearer distances; pull out the pinion head F (figs. 1 & 2) and use the rack and pinion. The distance may either be estimated, or paced off, and the lens set to the required distance on the scale (in feet) or the image can be more accurately focussed by using the ground glass screen.**

For Snapshots.

In nature just the reverse prevails to what we obtain with the camera focussed at infinity, as comparatively near objects are seen more sharply with the eye than those in the extreme distance, which usually are softened or diffused by the effect of haze and distance. **It is much preferable for snapshots if instead of the lens being set to infinity it is set for a nearer distance, as by doing so the depth of field is increased, and objects nearer to the camera will be rendered sharper, while the amount of definition which will be lost in the distance will be scarcely perceptible.**

For Near Objects.

If the objects are very near the camera, either focus upon the ground glass screen or carefully estimate the distance, and use a medium stop. **Focus upon a point half-way between the points you want to get sharp** (always, however, remembering that if an object is very near the camera you will have to focus a point somewhere nearer to you than exactly mid-way), **and then a medium stop will generally be sufficient to obtain all the sharpness required.**

Small versus Large Stops.

From the previous paragraphs we shall have realised the functions of the lens diaphragm. The biting crispness which unlimited depth of field introduces is not with every subject a desirable quality. **For portraits, for example, it is certainly preferable to use as large a stop as possible,** as the diffusion in the background enhances the pictorial qualities of the picture, while, of course, the rapidity of the lens is greater and the exposure shorter.

An Exercise.

The beginner is advised to make the following experiment before exposing a plate, as by doing so he will speedily learn all the points concerning the use of the diaphragm which it is necessary for him to know.

Set the camera upon a tripod, extend the camera and focus upon infinity. Then notice how a near object is blurred, focus upon this and notice how sharpness is lost in the distance. Stop down—the image is darkened, but this would be allowed for by a longer exposure being given—until the distance is also sharp. Open the lens again, and focus upon an object somewhat further removed than the near object which you previously focussed. Stop down until both of these and the distance are in focus, and it will be found that sharpness throughout will be obtained at a larger stop than was necessary when we focussed upon the nearest object.

If this be done Divisions II. and III. of the present section will be at once understood, and the worker is not likely at any time to experience any difficulties with focussing.

DIVISION IV.

The Single Combination.

Goerz Lenses are composed of two elements, either of which can be used as a separate lens. The single combinations are of approximately twice the focal length of the complete lens, and a corresponding increase of camera extension is required. When objects at a distance have to be photographed, they may be rendered on too small a scale to be useful; **in such a case the single combination should be used,** as it will in consequence of its longer focus give a picture twice the size of that obtained with the complete lens. An even larger size of image can be obtained by the employment of a Telephoto Attachment. The single combination of the "Dagor" is also very suitable for portraiture, giving at its open aperture a slight softness of definition most desirable for such work.

The front combination is used, the value of the stops is less and the intensity of the lens is reduced by about one-third. For convenience we append a table which gives the value of the stops of the front combination.

Crisp definition with the single combination of the "Dagor" will be obtained if it is stopped down to F.19 or a little more; that is to the F.11 mark on the complete lens. At open aperture the single will give a soft definition which is very often much admired for portraiture. The "Celor" and "Syntor" single combinations cannot be used at a greater aperture than F.32, that is for the front combinations a little beyond F.16 of the diaphragm marking, and the Tenastigmat at about F.36.

When lens is stopped to following F. No. on lens tube		the aperture of the front combination is	When lens is stopped to following F No. on lens tube		the aperture of the front combination is
		"Dagor."			
f/6·8	...	f/11·8	f/22	...	f/38·1
f/8	...	f/13·8	f/32	...	f/55 5
f/11	...	f/19	f/45	...	f/78·1
f/16	...	f/27.7	f/64	...	f/109·2
		"Celor."			
f/4·5	...	f/8	f/11	...	f/19·6
f/4·8	...	f/8·6	f/16	...	f/28·5
f/5·5	...	f/9·8	f/22		f/39 2
f/6·3	...	f/11·5	f/32	...	f/57·1
f/6·8	...	f/12·1	f/45	...	f/80·3
f/8	...	f/14·3	f/64	...	f/112·4
		"Syntor."			
f/6·8	...	f/12 2	f/22	...	f/39·6
f/8	...	f/14·4	f/32	...	f/57·6
f/11	...	f/19·8	f/45	...	f/81
f/16	...	f/28·8	f/64	...	f/113·5
		"Tenastigmat."			
f/6·8	...	f/12·5	f/22	...	f/40·1
f/8	...	f/14·9	f/32	...	f/60·1
f/11	...	f/20·3	f/45	...	f/81·5
f/16	...	f/29·1	f/64	...	f/114

To use the Double Extension.

Remove the back combination of the lens by unscrewing. Open the camera and draw out the lens carriage to the usual infinity mark. Disengage the tabs which keep the bellows up to the front, and rack out the camera until the line towards the back of the travelling base, and on the left-hand side of same, faces the mark ∞ on the left-hand fixed rail of the base. Nearer objects are focussed in the

usual way. The focussing scale on the camera base is for the complete lens only—not for the single combination.

The double extension also permits the worker to copy objects almost full size. The camera is extended fully, and the **complete lens** is used, the object being placed from the lens about the same distance as the latter is from the plate—a trial will speedily get the right distance. The image should be focussed upon the screen. As the lens is now of approximately double the focal length it is when being used in the ordinary manner, the value of the stops is halved, e.g., F.11 is equal to F.22, and so on, and a corresponding increase of exposure must be given.

When photgraphing full-size small objects with marked relief, such as small models or statuettes, the use of the telephoto attachment (see page 21) is preferable to simply using the camera and extra extension, for unless the telephoto attachment is employed for this purpose there is a danger of exaggerated perspective owing to the closeness of the camera to the object being photographed.

DIVISION V.

The use of the Wide-Angle Lens.

Often when photographing in confined situations, and especially in interiors, the worker finds that a standpoint somewhat further back than he is able to go is necessary to secure a perfect picture. In such cases the only remedy is the use of a wider angle lens, which, by depicting the objects on a smaller scale, includes more of the subject. Wide-angle lenses can be adapted to the Tenax Cameras without trouble. To the quarter-plate camera a lens of 3 inches focus can be fitted as a wide angle; to the 5 x 4, one of $3\frac{1}{2}$ inches focus; to the post card, one of $4\frac{3}{4}$ inches focus; and to the half-plate, one of 5 inches focus.

To use the W.A. Lens.—Unscrew the cells of the ordinary lens from the shutter and insert the two cells of the wide-angle. Ignore the F indicators on the shutter for the ordinary lens, and use the special scale of stops for the shorter focus lens.

Bring the front with the lens panel forward and allow the infinity catch to engage in the slot nearest the back of the camera, this slot is provided only with those cameras

which are fitted with wide-angle attachments. When using the wide-angle lens, the image should, as a rule, be focussed on the screen. A scale is, however, provided for use if required.

The single combinations of the wide-angle lens can be used in the same manner as those of the ordinary lens, and will often be found most serviceable. When a wide-angle lens is supplied the worker has at hand lenses of the following foci:—

With the	Quarter-plate	camera,	3, $4\frac{3}{4}$, 6 & $9\frac{1}{2}$ ins.
,,	5 x 4	,,	$3\frac{1}{2}$, 6, 7 & 12 ins.
,,	Postcard	,,	$4\frac{3}{4}$, $6\frac{5}{8}$, $9\frac{1}{2}$, & $13\frac{1}{4}$ ins.
,,	Half-plate	,,	5, 7, 10 & 14 ins.

SECTION III.

The Telephoto Lens.

Even the use of the single combination of the lens may at times not be sufficient to obtain an image of a pleasing size, and recourse can then be had to the Telephoto Attachment, an accessory by which increased sizes of images is given. It is especially valuable on those

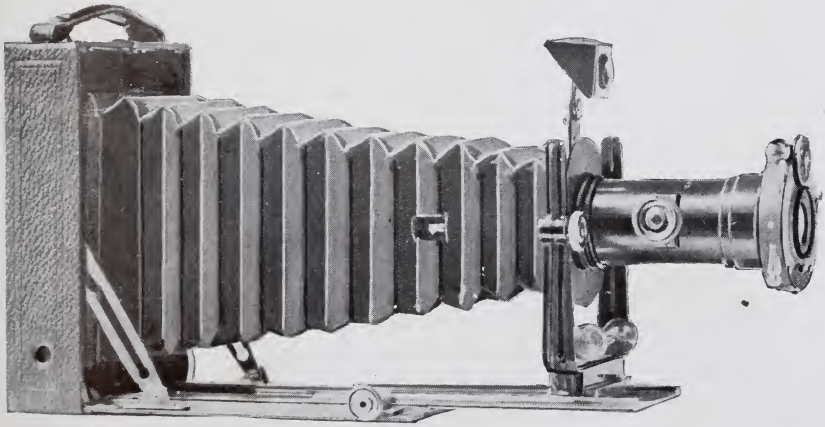

Fig. 9—The "Manufoc" Tenax Double Extension and Telephoto Attachment.

occasions when an image on a large scale of a distant object is required. With the Tenax Cameras two different sizes of images are obtainable, one taken with the complete lens, and another about twice the size with the single combination of lens, but by the use of the Telephoto Attachment the usefulness of the camera is considerably increased owing to its being possible to obtain a number of images of varying size. In the case of the $\frac{1}{4}$-plate camera it will give an image from $4\frac{1}{2}$ to $6\frac{3}{4}$ times as large as that given by the ordinary lens; the 5 × 4 gives magnifications of $5\frac{1}{2}$ to 8; the Post-card Camera gives magnifications from $4\frac{1}{4}$ to $5\frac{3}{4}$; and the half-plate up to $5\frac{2}{3}$ diameters. Lower magnifications can be obtained, but the plate is not then fully covered.

To Fix the Telephoto Attachment.

To "Manufoc."

Bring the camera front out to infinity, raise the front by turning the screw J (fig. 1) as far as it will go, and then lift the panel out of the two supports. Now unscrew the lens and shutter from their flange, by turning to the left. Then screw them into the end of the Telephoto Attachment, and the latter in the flange on the panel. Place the panel on the supports again, press it down, and turn the screw J until in position.

To "Taro" Tenax.

It is only necessary to unscrew the lens and shutter from the front. The telephoto tube is then screwed into the flange into which the shutter was fitted, and the lens and shutter into the front of the telephoto tube.

Note.—The cameras must in all cases where the Telephoto Attachments are ordered subsequently to its original delivery, be sent to C. P. Goerz Optical Works, Ltd., for fitting.

To Use the Telephoto Attachment.

It will be found preferable to arrange the focussing screen and Telephoto combination so that the subject appears the desired size upon the plate rather than to work to a determined magnification. The image should first be roughly focussed by moving the lens front and then fine focussing is effected by the rack on the tele-tube. It should be remembered that at any extension of the camera equal to, or beyond that required for the use of the posi-

tive lens at infinity, the tele-picture may be brought to a focus by adjusting the tele-lens, the distance between the negative lens and the screen determining the magnification and also the exposure. For Telephoto work the camera should be used on a rigid stand. The aluminium stand catalogued may be used with advantage when in conjunction with the stand top, a small table which presents a wider and a firmer base for the camera. The stand top is indeed to be recommended for use with the Telephoto attachment whatever form of stand is used.

For Portraiture with the Telephoto Attachment.

Place the sitter about ten feet away. A good head and shoulder portrait can then be taken with the Telephoto Attachment.

Exposure with the Telephoto Lens.

A considerable reduction in rapidity is unavoidable when a positive lens is used in conjunction with a tele-negative lens, and theoretically this is laid down as being equal to that obtaining when the stop in use is multiplied by the magnification, or, as some workers prefer to put it, that the intensity is reduced in proportion to the square of the magnification; consequently, if we know the exposure required for the positive lens, the time needed for the tele-photograph is easily calculated. If we assume that our positive is stopped to F/11, and this requires an exposure of two seconds, and we are giving a magnification of three, then the exposure required is according to the first method, F/11 x 3 , or F/33; or by the second method $2 \times 3^2 = 2 \times 3 \times 3 = 18$ secs. With either system the resulting figure is the same. To facilitate the calculation of the exposures the magnifications are read through an aperture on the tube. So soon, however, as we are photographing objects even at a comparatively short distance away the rule just given has to be modified unless we are to obtain the effect of over exposure, and we can under such circumstances safely cut down the exposure to one-half or even one-third of that given by following the rule given. This is an important point which should not be lost sight of; its observation often means greatly improved results, and also enables the worker to obtain successful instantaneous tele-photographs under conditions which would have apparently made the attempt hopeless had the rule given us by theory been slavishly adhered to.

The use of a screen or filter will, of course, increase the required exposure to exactly the same extent as it does when working with an ordinary positive lens.

Development of the Telephoto Negative.

Care should be taken in development so that the error of over-exposure, to which the tele-photographer is prone, may be checked. Contrast is usually to be aimed at. No special developer is necessary, but it should be so compounded, an extra proportion of the reducing agent itself being added, that the solution will produce contrast. The flat images often noticeable with tele-photographs are largely avoided with the Goerz Attachments in consequence of the interior of the tubes of the latter being lined with a substance effectually preventing reflections which degrade the brilliancy of the image. The use of a yellow screen, or preferably a Goerz Filter, will always give a brighter image when the subject is at some distance from the camera.

The after-treatment of the tele-negative differs in no way from the corresponding processes in ordinary photography.

Simple Formulae for Telephotography.

The following will be found useful:—

To find equivalent focus of combination when used for objects at infinity, multiply focus of positive by magnification.

To find magnification, divide the distance between negative lens and focussing screen by the focus of the negative lens, and add 1. With all Goerz Telephoto Attachments, the magnification can at once be accurately determined by referring to the scale engraved on the tube. A pointer indicates the magnification in use, rendering measuring or calculation unnecessary.

To find camera extension required for a given magnification, multiply the focus of the negative by the desired magnification less 1.

The Criterion Press
London & Leicester